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SUBJECT: Forwards comparison of safety-related design aspects of Unit 2 relative to Unit 1,in response to NRC request & to support licensing of Unit 2.

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J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

July 31, 1984

PGandE Letter No.: DCL-84-278

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-323
Diablo Canyon Unit 2
Unit 2 Specific Design Aspects

Dear Mr. Knighton:

At the request of the NRC Staff, and to support the licensing of Unit 2, PGandE is providing a comparison of safety-related design aspects of Diablo Canyon Unit 2 relative to Unit 1.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. O. Schuyler

J. O. Schuyler

Enclosure

cc: J. B. Martin
Service List

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ENCLOSURE

DIABLO CANYON NUCLEAR POWER PLANT

UNIT 2 SPECIFIC DESIGN ASPECTS

SUMMARY

This submittal which supplements PGandE's letter to Mr. D. G. Eisenhut on October 6, 1983 describing the Unit 2 Design Review Effort, provides a comparison of safety-related design aspects of Unit 2 relative to Unit 1. The comparison encompasses the following areas of design: (1) Nuclear steam supply system (NSSS) designed by Westinghouse, (2) Safety-related structures, (3) Safety-related balance-of-plant (BOP) fluid systems, and (4) Safety-related electrical systems.

For the most part, Units 1 and 2 are of the same design. There are, however, some specific design differences based upon the configuration of Unit 2 and its later construction permit date. The Unit 2 construction permit was issued on December 9, 1970, while the Unit 1 permit was issued on April 23, 1968. The major designs pertain to both units. Essentially the same licensing criteria were applied to each. Some facilities, such as the auxiliary building, are common to (shared by) both units. The below-listed Unit 2-specific design aspects are of the same level of detail found in the FSAR. Most of the specific design aspects were provided in the FSAR for Unit 1 and Unit 2 or its amendments and following a parallel review of both Units, the NRC Staff issued a Safety Evaluation Report in October 1974. This parallel review continued through Supplementary Safety Evaluation Report number 17 which was issued in February of 1984.

I. Nuclear Steam Supply System

A basic Westinghouse 4-loop NSSS is installed in each plant. Their designs are the same with the only significant differences being in the thermal rating of the reactor core and in some structural aspects of the reactor vessel due to its later procurement and in the overpressure protection features.

A. Core Thermal Rating

The core thermal rating is two percent higher in Unit 2 than in Unit 1 (3411 vs. 3338 Mwt). This change in rating reflects the evolution of the Westinghouse 4-loop design. The thermal rating per foot of fuel length is correspondingly higher. The slight increase in output for Unit 2 is due to an upgraded turbine generator design. While the minimum DNBR (departure from nucleate boiling ratio) at nominal conditions is lower in Unit 2, the minimum DNBR for design transients is greater than 1.30 for both Units. All Chapter 15 FSAR accident evaluations are applicable to both units and are based on the more conservative Unit 2 design parameters except:

1. Because of different stuck control rod locations, steam break accidents are evaluated separately for each unit.

2. For control-rod misalignment, withdrawal, and ejection accidents, separate evaluations were made, but were later found to be equally applicable to both units.

B. Reactor Vessel

1. Internals

The structure for limiting the neutron exposure to the Unit 2 pressure vessel (neutron shield panels) is a more recent design than the annular thermal shield used in the Unit 1 vessel.

2. Pressure Vessel

Specific differences in the vessel are:

(a) 10 CFR Part 50.55a(c) specifies the applicable edition of the ASME Boiler and Pressure Vessel Code (Section III) to use to determine the requirements for reactor vessel design, fabrication and material selection. The specification is based on the date a vessel is ordered. Therefore, the 1965 edition (through Summer 1966 addenda) applies to Unit 1 and the 1968 edition applies to Unit 2.

(b) The surveillance programs for monitoring the toughness properties of the reactor vessel beltline material in both units meet the requirements of 10 CFR 50, Appendix H. However, the details of the programs differ because of changes in the applicable standard (ASTM E 185) between the 1970 and 1973 editions. These editions were respectively in effect when the Unit 1 and 2 surveillance programs were instituted during the vessel design stages.

(c) Because of the different material specifications, the estimated nil-ductility transition temperature (RT_{NDT})of the limiting material in the Unit 2 reactor vessel at the end-of-service life is different from that in the Unit 1 vessel.

C. Overpressure Protection

Unit 1 was fitted with an interim design "water.solid alarm". The final overpressure protection design was subsequently installed in both units. The interim design was left in service as a convenience to Unit 1 operators but was never installed on Unit 2.

II. Safety-Related Structures

Some design aspects of Unit 2 have evolved separately as a result of minor differences in layout, such as piping, or the different power ratings. Different response spectra are developed for Unit 2 at locations where equipment locations differ from the Unit 1 arrangement.

A. Containment Annulus

The containment annulus design contains some minor differences due to specific equipment locations and routing of piping, HVAC ducts and cable trays.

B. Auxiliary Building

The turbine missile shield for the Auxiliary Feedwater pumps is a steel/concrete composite for Unit 2 while in Unit 1 it is steel only. Both provide adequate missile protection.

C. Fuel Handling Building (FHB)

Because of availability, A441 steel was used in approximately the southern two-thirds end of the FHB Unit 2. These members provide at least the same cross-sections and, in some cases, larger sections than those of A36 steel used elsewhere in the FHB. Since A441 steel has higher allowables than A36 steel, the Unit 2 members usually have at least the same margins of safety than Unit 1 members.

D. Turbine Building

The Unit 2 end of the turbine building differs from the Unit 1 end by having two less bays, a slightly longer turbine pedestal length, a higher load rated bridge crane auxiliary hook, and some differences in the westside buttress area due to presence of the onsite technical support center. Other minor differences occur due to piping and equipment layout considerations.

III. Safety-Related BOP Fluid Systems

Designs throughout the safety-related balance-of-plant (BOP) fluid systems (including HVAC) were originally, and are still substantially, the same in both units. Some differences have resulted from the different ratings in reactor power level (see above) and specific Unit 2 arrangements, physical layouts and equipment ratings.

A. The main turbine generators and their auxiliary systems are designed for steam flows corresponding to the maximum design thermal output from each reactor. Hence, the Unit 2 turbine and auxiliary systems have higher power ratings than their Unit 1 counterparts.

B. Arrangements and physical layouts are locally determined and are the result of the following:

   1. Pipe routing is opposite hand, but installed equipment designs (such as pump casing nozzle locations) are not, so piping must be differently configured near equipment to account for equipment nozzle locations.

   2. Unit 1 experience has resulted in some changes in pipe routing on Unit 2 to minimize interferences and facilitate construction.

C. Equipment ratings may vary as a result of purchasing analogous equipment from different manufacturers.

D. Local variations in equipment geometry and piping layout produce different results in pipe break analysis; for example, postulated pipe breaks are not always in the analogous location for each unit. Consequently, the resulting provisions required for protection against jet impingement on vital equipment and against compartment overpressurization are different. Also, for space availability and cost considerations, some jet impingement barrier requirements were eliminated in Unit 2 by relocation/rerouting of vital equipment, instrumentation and conduits. However, the design criteria, process and methodologies were the same for both units.

E. Unit 1 and Unit 2 have identical Post-LOCA Sampling Systems. Unit 1 also has an interim Post-LOCA sampling system which will be utilized in the near term as a backup. Unit 2 has no interim system.

IV. Safety-Related Electrical Systems

The safety-related (vital) electrical systems are functionally similar except for the handling of common loads as discussed below. Other differences are minor, such as the rerouting of Class 1E raceways.

A. 4160V System

There are a total of five diesel generator sets in both units. Two diesel generator sets are dedicated to each unit. The fifth diesel can supply power to either unit and is located in the Unit 1 area of the turbine building.

B. DC System

The Unit 2 DC system (vital) supplies fewer loads than the Unit 1 system because the Unit 1 system feeds some common loads.

C. Backup Overcurrent Protection

Backup over current protection has been designed for electical circuits which penetrate the containment for both units. Because Unit 2 was at an earlier stage of construction than Unit 1, the protection has been installed on Unit 2. It is not yet installed on Unit 1 but is scheduled for installation during the first Unit 1 refueling outage. This difference is not one of design but of construction schedule. It is included here for completeness.